National Aeronautics and
Space Administration

Uncovering the Sun's Swirling Jets

Powerful jets of plasma continuosly erupt over the entire surface of the Sun on a regular basis. These jets transfer energetic particles from the solar surface, heating the Sun's atmosphere and feeding gas into the solar wind—a stream of particles that emanates from the Sun and impacts the space environment close to Earth.

We produce magnetohydrodynamic (MHD) simulations that include detailed physical processes, running at very high (14 km per pixel) spatial resolution. Harnessing the power of NASA's Pleiades supercomputer, we show for the first time how such jets naturally occur in simulations of the solar atmosphere. The simulations help explain the enigmatic observations taken with the Interface Region Imaging Spectrograph (IRIS) observatory, and provide unique insight into the origin and importance of these powerful jets.

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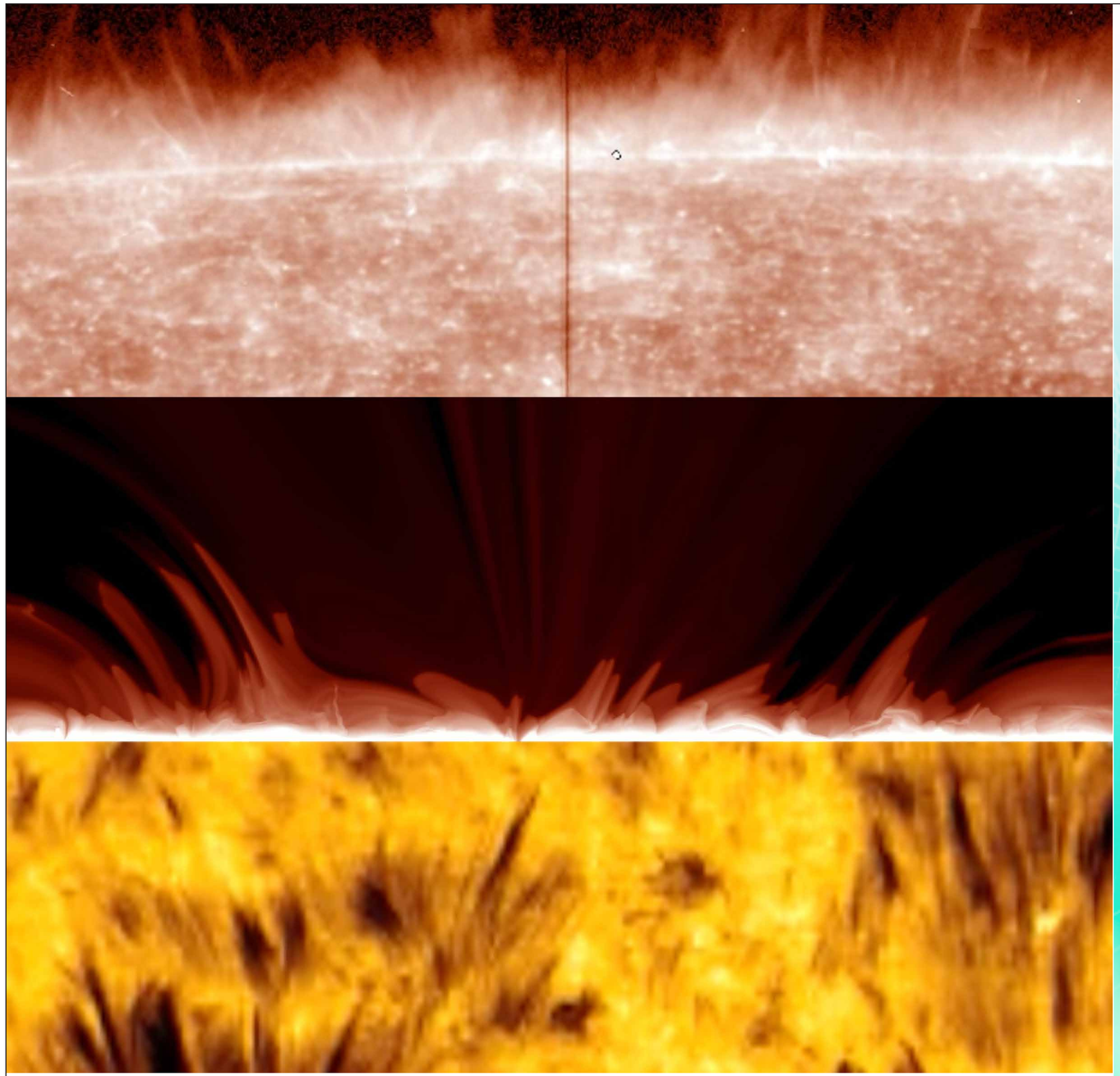
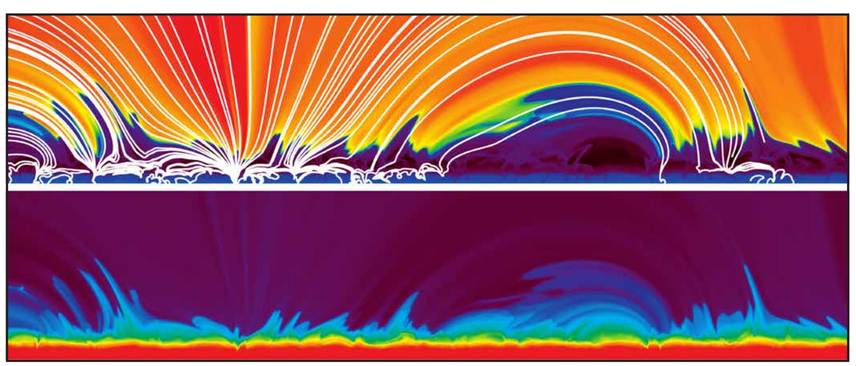


Comparison of observed and simulated jets. Top row: Jets at the solar limb observed by the IRIS mission. Middle row: Side view from a simulation showing similar jets. Bottom row: Jets, seen as dark features, as observed on the solar disk by the Swedish 1-m Solar Telescope. *Juan Martínez Sykora, Bart De Pontieu, Lockheed Martin Solar and Astrophysics Laboratory*



Side view of a simulated solar atmosphere from a 2.5-dimensional magnetohydrodynamic model. Top: Logarithm of temperature with overlapping magnetic field lines (white). Bottom: Logarithm of density. The panels show elongated jets of dense, cool gas that are violently ejected from the solar surface. The size of the computational box is 96 x 40 megameters with a resolution of 14 kilometers/pixel. *Juan Martínez Sykora, Lockheed Martin Solar and Astrophysics Laboratory*